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Coatings

TECHNICAL FIELD

An element for making an electric contact to a contact member for enabling an electric current to flow between said element and said contact member. The element comprising a body having at least a contact surface thereof coated with a contact layer to be applied against said contact member. The contact layer comprises a continuous or discontinuous film comprising a multielement material.

BACKGROUND ART

Recent studies has shown that compounds having the general formula $M_{n+1}AX_n$ exhibit unusual and exceptional mechanical properties as well as advantageous electrical thermal and chemical properties. Despite having high stiffness these compounds are readily machinable, resistant to thermal shock, unusually damage tolerant, have low density and are thermodynamically stable at high temperatures (up to 2300°C in vacuum). M is a transition metal or a combination of transition metals, n is 1, 2, 3 or higher, A is a group A element or a combination of a group A element, and X is Carbon, Nitrogen or both. Group A element is any of a list: Aluminium Al, Silicon Si, Phosphorus P, Sulfur S, Gallium Ga, Germanium Ge, Arsenic As, Cadmium Cd, Indium I, Tin Sn, Thallium Tl, Lead Pb. Transition metal M is any of a list: Scandium Sc, Titanium Ti, Vanadium V, Chromium Cr, Zirconium Zr, Niobium Nb, Molybdenum Mo, Hafnium Hf, Tantalum Ta.

CLAIMS

1. A contact element for making an electric contact to a contact member (5, 15, 19, 41) for enabling an electric current to flow between said contact element and said contact member, said contact element (3,14, 20, 32, 42) comprising a body (6) having at least a contact surface (2, 4, 16, 21, 22, 24, 30, 34, 43, 44) thereof coated with a contact layer arranged to be applied against said contact member, which contact layer comprises a film comprising a multielement material, **characterised in** that said multielement material comprises material with equal composition as at least one of a carbide or nitride that is described as $M_{n+1}AX_n$ where M is a transition metal or a combination of a transition metals, n is 1, 2, 3 or higher, A is a group A element or a combination of a group A element, and X is Carbon, Nitrogen or both, said multielement material also comprise at least one nanocomposite comprising single elements, binary phases, ternary phases, quaternary phases or higher order phases based on the atomic elements in the corresponding $M_{n+1}AX_n$ compound.

2. A contact element according to claim 1, **characterised in** that said nanocomposite comprise at least two of the following phases: M-A, A-X, M-A-X, X, M-X, or a combination of said materials.

3. A contact element according to any of claim 1 or 2, **characterised in** that said nanocomposite comprise at least one of the following of M-X and M-A-X nanocrystals (C, D, E) and at least one of the following amorphous regions (J, K, L) with M, A, X elements in one or several phases, such as M-A, A-X, M-A-X, or X.

4. A contact element according to any of the preceding claims, **characterised in** that said transition metal is Titanium; Ti, n is 1, 2, 3 or higher, X is C; Carbon and A is at least one of Silicon; Si, Germanium; Ge or Tin; Sn or a combination of said atomic elements.

50. A contact arrangement according to claim 48, **characterised in** that said moving part is a slip ring (19).

51. A contact arrangement according to any of claims 38-42, **characterised in** that it is adapted to establish an electric contact in a tap changer(28) for a transformer for making a contact to different winding(29) turns of the transformer.

52. A contact arrangement according to any of claims 38-42, **characterised in** that one of the contact element (32) and the contact member (33) belong to the parts movable with respect to each other in a relay for establishing an electric contact there between when the relay operates.

53. A method for creating a thin layer on a contact element according to any of the claims 16-22 for making a good electric contact of said contact element to a contact member for connection to said contact member and having a low friction coefficient with respect to said contact member and contact element pressed together for forming said good electric contact, **characterised in** that the multielement material is coated with the metallic layer.

54. A method for creating a thin layer on a contact element according to any of the claims 16-22 for making a good electric contact of said contact element to a contact member for connection to said contact member and having a low friction coefficient with respect to said contact member and contact element pressed together for forming said good electric contact, **characterised in** that the multielement material is blended in the metallic layer.

55. Use of a contact arrangement according to any of claims 38-42, in which a contact for enabling contact to an electronic device, such as an integrated circuit (IC) is covered with a said multielement material film enabling electrical contact to the device.

AMENDED CLAIMS
[received by the International Bureau on 10 June 2005 (10.06.05);
original claim 1 amended, remaining claims unchanged (1 page)]

1. A contact element for making an electric contact to a contact member (5, 15, 19, 41) for enabling an electric current to flow between said contact element and said contact member, said contact element (3,14, 20, 32, 42) comprising a body (6) having at least a contact surface (2, 4, 16, 21, 22, 24, 30, 34, 43, 44) thereof coated with a contact layer arranged to be applied against said contact member, which contact layer comprises a film comprising a multielement material, **characterised in** that said multielement material comprises material with equal composition as at least one of a carbide or nitride that is described as $M_{n+1}AX_n$ where M is a transition metal or a combination of a transition metals, n is 1, 2, 3 or higher, A is a group A element or a combination of a group A element, and X is Carbon, Nitrogen or both, said multielement material also comprise at least one nanocomposite comprising single elements, binary phases, ternary phases, quaternary phases or higher order phases based on the atomic elements in the corresponding $M_{n+1}AX_n$ compound.

2. A contact element according to claim 1, **characterised in** that said nanocomposite comprise at least two of the following phases: M-A, A-X, M-A-X, X, M-X, or a combination of said materials.

3. A contact element according to any of claim 1 or 2, **characterised in** that said nanocomposite comprise at least one of the following of M-X and M-A-X nanocrystals (C, D, E) and at least one of the following amorphous regions (J, K, L) with M, A, X elements in one or several phases, such as M-A, A-X, M-A-X, or X.

4. A contact element according to any of the preceding claims, **characterised in** that said transition metal is Titan; Ti, n is 1, 2, 3 or higher, X is C; Carbon and A is at least one of Silicon; Si, Germanium; Ge or Tin; Sn or a combination of said atomic elements.